

generally light and scattered between the 7th and 15th; but from the 19th to 23d, and from the 27th to 31st, the showers were quite general and the rainfall copious. In fact, most of the rain fell during the latter half of the month, and at the close of the month all vegetation was in fine condition, except in southern Illinois, where droughty conditions prevailed.

The average precipitation for the district, as shown by the records of 309 stations, is 3.56 inches, which is 0.52 inch below the normal. The greatest amount, 8.73 inches, occurred at Fayette, Iowa, and the least, 0.22 inch, at Cairo, Ill. The greatest amount in 24 consecutive hours, 4.20 inches, occurred at New London, Minn., on the 15th.

The average depth of unmelted snowfall was 0.3 inch. The greatest depth was 7 inches, at Hannah, N. Dak., and at many stations in all sections none occurred. Measurable precipitation occurred on an average of 9 days.

SUNSHINE AND CLOUDINESS.

The average number of clear days was 16; partly cloudy, 9; cloudy, 6. The duration of sunshine was considerably above the normal.

WIND.

Southwest winds prevailed. The highest velocity reported was 48 miles per hour, from the northeast, at Devils Lake, N. Dak., on the 26th.

SEVERE LOCAL STORMS.

Mr. Clarence J. Root, section director at Springfield Ill., reports that damaging local storms occurred in Tazewell and Woodford Counties, Ill., on the 28th, and that reports of deaths and damage by lightning were received at various times from different places in that State.

Mr. M. L. Fuller, local forecaster, Peoria, Ill., has kindly furnished the following report on the storm of the 28th at Pekin, Tazewell County, Ill.:

About 2 p. m. of May 28, unusually severe thunderstorms visited portions of Tazewell County, Ill., with heavy local downpours of rain, causing floods and washouts in places, and with hail or wind reported from some points. At Pekin, Ill., damage was done by wind to an amount variously estimated at \$25,000 to \$50,000. Many trees in the city, some of them a foot to 18 inches in diameter, were blown down, one street being rendered temporarily impassable. A few awnings, plate-glass windows, and roofs of buildings were wrecked. Along the river a pumping station built of concrete blocks was demolished, a railroad depot unroofed, and two or three ice houses badly broken up. Near one of the ice houses, two boys, Clyde Sakers, aged 17 years, and Frank Woodley, aged 13, were killed by flying wreckage. A total of seven other persons in the city were more or less injured. The damage wrought was chiefly to larger or exposed trees and exposed portions of buildings. The greatest destruction was along the river bank which rises somewhat abruptly 15 feet or so above a level mile or two of bottom lands. All wreckage appears to have been scattered in the same general direction. Although reported in the press as a "cyclone," the storm appears to have been a straight blow accompanied by the usual thunder-squall roll of agitated wind cloud.

The following is an extract from an account of a severe local storm at Cedar Rapids, Iowa, on May 19, 1911, as published in the Republican of that city, on May 20:

The most destructive storm in many years struck west Cedar Rapids last evening at about 6.45 o'clock, and the damage done to property will run up into the thousands of dollars, not counting the destruction of shade and fruit trees. The storm track was about two blocks wide, and extended diagonally toward the river. There was plenty of warning, as the black-looking clouds plainly heralded the storm's approach. The gusts of wind became stronger, and, when in a sudden fury, the gale swept with resistless force, trees were snapped and twisted off as easily

as if they were made of glass. Wires were tangled and broken, putting the telephone and light service completely out of commission. The whole northwest portion of the west side was cut off from telephonic communication and thrown into darkness by the wrecking of a pole carrying the supply and feed wires up Fourth Street and throwing them across the trolley wire of the street railway company, on G Avenue. Great damage was done to the buildings at the Alamo. The skating rink and several other buildings were blown down, and others were badly damaged. Much of the fence surrounding the park was also blown down. In the vicinity of Kenwood, and between there and Twentieth Street, the storm seemed to concentrate its fury, and the damage done to houses and property will amount to several hundred dollars. Barns were unroofed, and doors and trees were scattered all along the boulevard. The building of the King-Crown Plaster Co. was badly wrecked. The lower two stories were constructed of concrete blocks, and the upper stories of wooden framework. The whole wooden top was caved in on the south and west sides and rent asunder and the concrete blocks were crushed. Large pieces of the building were carried more than a block, and timbers and boards went as far as the river. Several courses of the concrete blocks were caved in by the force of the wind, and the whole building was rendered a mass of ruins. Much minor damage was done, but no lives were lost, although several people were injured, and one seriously.

RIVERS.

Rivers are still below the normal stage, but a rise occurred during the latter half of the month.

Owing to good rains in the headwaters, both the Mississippi and Wisconsin Rivers rose steadily from about the middle of the month to near the close. The Wisconsin at Wausau, Wis., rose from 3.9 feet, on the 12th, to 6.7 feet on the 24th, and at Portage, Wis., from 3.6 feet on the 11th to 7.9 feet on the 28th. The Mississippi at La Crosse, Wis., rose from 2.1 feet on the 19th to 5 feet on the 27th; at Prairie du Chien, Wis., from 2.5 feet on the 15th to 6.4 feet on the 31st, and at Dubuque, Iowa, from 3 feet on the 20th to 6.7 feet on the 31st. After a year of very low water this rise was of decided benefit to most river interests, but higher water is needed for navigation.—J. H. Spencer, local forecaster.

Mr. J. M. Sherier, local forecaster, in charge of the Davenport, Iowa, river district, reports as follows:

Steadily rising stages in this river district during the last decade of May resulted from copious rains over the extreme northern portion of the watershed about the middle of the month. At the end of the month the stage of the Mississippi River at Muscatine, Iowa, was still lower than the corresponding time in 1910, but gauge readings between Dubuque and Davenport, Iowa, were generally higher than those of a year ago. The reading of 4.6 feet at Davenport on the 31st was exactly the same as recorded on that date last year.

The following item relative to steamboat traffic, on the Mississippi River in the vicinity of Burlington, Iowa, appeared in the Times-Republican, Marshalltown, Iowa, on May 8:

With the river showing an increased stage of water the steamboat men are feeling more encouraged, and last week was marked by a general awakening in traffic circles. The *St. Paul* and *Quincy*, huge liners of the Streckfus Co., were taken to St. Louis for alterations, and Capt. Blair went South en route to New Orleans with a large party of excursionists on the *Morning Star*. The *Helen Blair* has resumed her place in the Burlington-Davenport trade, and the *Keokuk* has started daily service south of Keokuk. The *Black Hawk* is coming every day from the south, and later on the *Columbia* will probably be put in the trade establishing a daily service from Davenport to this city.

ENGINEERING NOTES.

Muck work is being done on the streams in Iowa, with the view of conserving and developing the water power. Plans are already drawn and work will begin as soon as possible on a 4,000 to 6,000 horsepower hydroelectric plant, 10 miles below Fort Dodge Iowa, on the Des Moines River. The plant will cost approximately \$600,000, and the dam will be the second largest in the State, rivaled only by the one on the Mississippi River, at Keokuk, Iowa. The dam will be built after the plan of the big Spear Fish project, and will develop a 40 or 50 foot head of water. The banks on both sides of the river for some distance above the site of the dam are high, but

considerable farm land will be inundated, as the water will be backed up almost to Fort Dodge. Engineers declare the dam will generate 4,000 horsepower on a 24-hour basis, and 6,000 on a 12-hour basis, and the power can be distributed easily to Fort Dodge, Webster City, Lehigh, and Boone.

Work has also been started by the Iowa Power Co. on the construction of a series of dams on the Skunk and Iowa Rivers, which, with auxiliary steam plants, will produce 100,000 horsepower for use by the cities in southeastern Iowa. The Oakland Dam, one of the six along the Skunk, is an old one taken over by the new company. It has been rebuilt, new machinery has been installed and it was ready for business May 1, the day set for the reopening of the Oakland mills. At Augusta, the property adjoining either side of the dam has been recently purchased, and work at Augusta will be started shortly on the southernmost dam. At Wapello, on the Iowa River, a trench 3 miles in length is to be dug to give a greater and more permanent fall, and to overcome any possibilities of danger by high water. Mount Pleasant has already contracted for a supply of the power, and the promoters are meeting with encouragement in other southeastern Iowa cities. With the completion of the mammoth dam at Keokuk, 300,000 horsepower will be developed by water power in that vicinity.—*Jackson Sentinel, Maquoketa, Iowa, May 4.*

DRAINING THE AMERICAN BOTTOMS.

By CLARENCE J. ROOT, Section Director, United States Weather Bureau.

The American Bottoms occupy the low flat ground lying along the east bank of the Mississippi River and extending from Alton to Chester, in Illinois. This is one of the most fertile sections of the United States, but it is in constant danger of flooding. The first flood in this region, of which there is a reliable record, was that of 1724. During this and many subsequent floods the greater part of this valuable land was inundated. The greatest flood was in 1844.

The portion of the American Bottoms lying opposite St. Louis, Mo., and extending northward to the mouth of the Missouri River contains the city of East St. Louis (population 58,574), the cities of Venice, Madison, and Granite City, the terminals of all railroads entering St. Louis from the east, and large areas of valuable farm land. This district is bordered on the west by the Mississippi River, and on the north, east, and south by a ridge of bluffs extending from the river at Alton, in a wide semicircle, to a point opposite the south end of the city of St. Louis.

In June, 1903, the Mississippi River reached a height of 38 feet on the Weather Bureau gauge at St. Louis. This was 8 feet above the flood stage. Seventy per cent of this low land in Illinois was submerged, including about one-half of the city of East St. Louis. Crops were ruined, railroad traffic demoralized, and business suspended. Several lives were lost and the property loss ran into millions.

In order to protect this region from a recurrence of this condition, and to provide interior drainage, an organization, known as the "East Side Levee and Sanitary District," was formed. The district contains 96 square

miles. The protection will be obtained by constructing a system of levees and channels. The estimated cost of the entire undertaking will be \$6,500,000, all of which will be borne by the district.

Cahokia Creek rises near Litchfield, Ill., flows southwestward, and leaves the bluffs near the northeast corner of the district. It then flows through the bottoms and empties into the Mississippi River in East St. Louis. This stream, with its tributaries, drains a watershed back of the bluffs of 259 square miles. It is a menace to the district, not only as a source of backwater from the Mississippi flowing into the lower part of the stream, but on account of the large volume of water drained from the hills into the bottoms during the spring freshets.

A diversion channel is being dug from a point where the creek leaves the bluffs, about 14 miles north of East St. Louis, directly west to the Mississippi River, a distance of 4½ miles. The earth from this channel is placed to form levees on both sides, the one on the south extending from the bluffs to the river. The channel is 100 feet wide at the bottom and is 12 to 18 feet deep. The levees are 12 to 18 feet high and are set back 50 feet from the edge of the cut.

The front levee will extend from the diversion channel to a point 4 miles below East St. Louis. It will be 19 miles long and will follow, approximately, the east bank of the Mississippi River. This levee will be 8 feet wide on the top, sloping both ways, the thickness at the 1903 flood line being 43 feet. It will be 3.6 feet higher than the 1844 flood, and at least 7 feet higher than the flood of 1903. The levee will be sodded to prevent washing, and where it is exposed to the force of the current or to wave wash, it will be faced with reenforced concrete. The owners of the land lying between the front levee and the railroad embankments have agreed to fill their land, thus giving added security to the levee and tending to prevent seepage.

Another levee will be built on the south, extending from the bluffs to the south end of the front levee. This will complete a wall around the entire district, every point of which will exceed in elevation the highest water ever known.

For the purpose of interior drainage for the district, the present bed of Cahokia Creek, from the diversion channel to a point about 6 miles northeast of East St. Louis, will be cleared of drift and other obstructions, to allow the proper discharge of water from the smaller branches, county ditches, and the lateral canals that will be dug to drain the low ground. From this point a canal, 80 feet wide at the bottom, will be constructed running south to the Mississippi River near East Carondelet. It will pass to the eastward of the city of East St. Louis. Flood gates will be provided near its mouth, and during the presence of high water in the Mississippi River they will be closed. The water will then be pumped into the river.

About 75 per cent of the diversion channel is completed, together with the adjoining levees. Work on the front levee, along the river, has not been started, but it is hoped to have it completed by 1913. The interior drainage canal will be the last work undertaken.

NOTE.—The writer is indebted to Mr. W. McK. Brown, cooperative observer, Weather Bureau, and assistant engineer, the East Side Levee and Sanitary District, for maps and notes concerning the work.